

WHAT IS CLAIMED IS:

1. A discriminator for discriminating a sort of modulation technique to produce an information carrying signal, comprising
an analyzer supplied with said information carrying signal, and evaluating at least one feature of said information carrying signal found in a waveform of said information carrying signal; and
a judging unit connected to said analyzer, and investigating the evaluation supplied from said analyzer to see what sort of modulation technique is to exhibit said at least one feature so as to determine the sort of modulation technique employed in said information carrying signal.
2. The discriminator as set forth in claim 1, in which said analyzer further evaluates another feature of said information carrying signal found in said waveform of said information carrying signal, and said judging unit determines said sort of modulation technique on the basis of the evaluation to said at least one feature and said another feature.
3. The discriminator as set forth in claim 1, in which said at least one feature is a similarity of said waveform to plural reference waveforms.
4. The discriminator as set forth in claim 2, in which said at least one feature and said another feature are a similarity of waveform to plural reference waveforms and peak-to-peak intervals found in said waveform.
5. The discriminator as set forth in claim 3, in which said analyzer includes a wave discriminator comparing said waveform with a predetermined amplitude range to see whether or not said information carrying signal is fallen

within said predetermined amplitude range so as to determine a first time period in which said information carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said similarity on the basis of a ratio between said first time period and said second time period.

6. The discriminator as set forth in claim 5, in which said wave discriminator includes

a rectifier supplied with said information carrying signal and making said information carrying signal vary the amplitude in one of the positive and negative ranges,

an averaging circuit connected to said rectifier for determining an average value of said amplitude,

a comparator having two thresholds defining said predetermined amplitude range and comparing said information carrying signal with said two thresholds to produce an output signal representative of said first time period and said second time period, and

a signal generator connected to said comparator and producing an output signal representative of said similarity.

7. The discriminator as set forth in claim 6, in which one of said two thresholds is 80 percent of said average value, and the other of said two thresholds is 120 percent of said average value.

8. The discriminator as set forth in claim 4, in which said analyzer includes

a wave discriminator supplied with said information carrying signal, comparing said waveform with a predetermined amplitude range to see whether or not said information carrying signal is fallen within said predetermined amplitude range so as to determine a first time period in which said information carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said similarity on the basis of a ratio between said first time period and said second time period; and

plural modulation discriminators supplied with said information carrying signal, determining said peak-to-peak intervals of said information carrying signal, and producing output signals each representative of either consistency or inconsistency with one of plural sorts of modulation techniques,

said output signal of said wave discriminator and said output signals of said plural modulation discriminators being supplied to said judging unit.

9. The discriminator as set forth in claim 1, in which said information carrying signal is produced from an analog signal representative of sound or a data stream containing music data codes and meaningless codes, and said judging unit further determines that said information carrying signal was produced from said analog signal in the absence of the features unique to plural sorts of modulation techniques.

10. The discriminator as set forth in claim 9, in which said analyzer includes a wave discriminator supplied with said information carrying signal, comparing said waveform with a predetermined amplitude range to see whether or

not said information carrying signal is fallen within said predetermined amplitude range so as to determine a first time period in which said information carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said similarity on the basis of a ratio between said first time period and said second time period;

plural modulation discriminators supplied with said information carrying signal, determining said peak-to-peak intervals of said information carrying signal, and producing output signals each representative of either consistency or inconsistency with one of plural sorts of modulation techniques;

an analog signal discriminator supplied with said output signals of said plural modulation discriminators, and producing an output signal representative of said analog signal when said plural modulation discriminators determine that said plural sorts of modulation techniques are not found in said information carrying signal; and

a level analyzer supplied with said information carrying signal, and checking said information carrying signal to see whether or not the amplitude is wider than a predetermined range so as to produce an output signal representative of silence or sound,

said output signal of said wave discriminator, said output signals of said plural modulation discriminators, said output signal of said analog signal discriminator and said output signal of said level analyzer being supplied to said judging unit.

11. The discriminator as set forth in claim 10, further comprising a signal separator for separating said information carrying signal into a first-channel signal and a second-channel signal, and said level analyzer and said wave discriminator are duplicated so that said first-channel signal and said second channel signal are supplied separately to said level analyzers and said wave discriminators and selectively to said plural modulation discriminators.

12. A method for discriminating a sort of modulation technique employed in an information carrying signal from other sorts of modulation techniques, comprising the steps of:

- a) receiving said information carrying signal;
- b) analyzing said information carrying signal so as to evaluate at least one feature of a waveform of said information carrying signal; and
- c) investigating the evaluation to see what sort of modulation technique is to exhibit said at least one feature so as to determine the sort of modulation technique employed in said information carrying signal.

13. The method as set forth in claim 12, in which said at least one feature is a similarity of said waveform to reference waveforms.

14. The method as set forth in claim 12, in which another feature of said waveform is further evaluated in said step b), and said sort of modulation technique is determined on the basis of both of said at least one feature and said another feature.

15. The method as set forth in claim 14, in which said at least one feature and said another feature are a similarity of said waveform to reference waveforms and peak-to-peak intervals found in said waveform.

16. The method as set forth in claim 15, in which said information carrying signal is decided to be directly produced from an analog signal when said peak-to-peak intervals are not unique to plural sorts of modulation techniques.

17. A signal demodulator for reproducing an original signal from an information carrying signal, comprising:

a detector supplied with said information carrying signal, and including an analyzer supplied with said information carrying signal and evaluating at least one feature of said information carrying signal found in a waveform of said information carrying signal and a judging unit connected to said analyzer and investigating the evaluation supplied from said analyzer to see what sort of modulation technique is to exhibit said at least one feature so as to produce a control data signal representative of the sort of modulation technique employed in said information carrying signal; and

a demodulator responsive to said control data signal so as to select one of plural function planes respectively assigned to plural sorts of demodulation techniques, and reproducing said original signal from said information carrying signal through the demodulation technique on said one of said plural function planes.

18. The signal demodulator as set forth in claim 17, in which said analyzer further evaluates another feature of said information carrying signal found in

said waveform of said information carrying signal, and said judging unit determines said sort of modulation technique on the basis of the evaluation to said at least one feature and said another feature.

19. The signal demodulator as set forth in claim 17, in which said at least one feature is a similarity of said waveform to plural reference waveforms.

20. The signal demodulator as set forth in claim 18, in which said at least one feature and said another feature are a similarity of waveform to plural reference waveforms and peak-to-peak intervals found in said waveform.

21. The signal demodulator as set forth in claim 19, in which said analyzer includes

a wave discriminator comparing said waveform with a predetermined amplitude range to see whether or not said information carrying signal is fallen within said predetermined amplitude range so as to determine a first time period in which said information carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said similarity on the basis of a ratio between said first time period and said second time period.

22. The signal demodulator as set forth in claim 21, in which said wave discriminator includes

a rectifier supplied with said information carrying signal and making said information carrying signal vary the amplitude in one of the positive and negative ranges,

an averaging circuit connected to said rectifier for determining an average value of said amplitude,

a comparator having two thresholds defining said predetermined amplitude range and comparing said information carrying signal with said two thresholds to produce an output signal representative of said first time period and said second time period, and

a signal generator connected to said comparator and producing an output signal representative of said similarity.

23. The signal demodulator as set forth in claim 22, in which one of said two thresholds is 80 percent of said average value, and the other of said two thresholds is 120 percent of said average value.

24. The signal demodulator as set forth in claim 20, in which said analyzer includes

a wave discriminator supplied with said information carrying signal, comparing said waveform with a predetermined amplitude range to see whether or not said information carrying signal is fallen within said predetermined amplitude range so as to determine a first time period in which said information carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said similarity on the basis of a ratio between said first time period and said second time period; and

plural modulation discriminators supplied with said information carrying signal, determining said peak-to-peak intervals of said information carrying

signal, and producing output signals each representative of either consistency or inconsistency with one of plural sorts of modulation techniques,

said output signal of said wave discriminator and said output signals of said plural modulation discriminators being supplied to said judging unit.

25. The signal demodulator as set forth in claim 17, in which said information carrying signal is produced from an analog signal representative of sound or a data stream containing music data codes and meaningless codes, and said judging unit further determines that said information carrying signal was produced from said analog signal in the absence of the features unique to plural sorts of modulation techniques.

26. The signal demodulator as set forth in claim 25, in which said analyzer includes

a wave discriminator supplied with said information carrying signal, comparing said waveform with a predetermined amplitude range to see whether or not said information carrying signal is fallen within said predetermined amplitude range so as to determine a first time period in which said information carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said similarity on the basis of a ratio between said first time period and said second time period;

plural modulation discriminators supplied with said information carrying signal, determining said peak-to-peak intervals of said information carrying

signal, and producing output signals each representative of either consistency or inconsistency with one of plural sorts of modulation techniques;

an analog signal discriminator supplied with said output signals of said plural modulation discriminators, and producing an output signal representative of said analog signal when said plural modulation discriminators determine that said plural sorts of modulation techniques are not found in said information carrying signal; and

a level analyzer supplied with said information carrying signal, and checking said information carrying signal to see whether or not the amplitude is wider than a predetermined range so as to produce an output signal representative of silence or sound,

said output signal of said wave discriminator, said output signals of said plural modulation discriminators, said output signal of said analog signal discriminator and said output signal of said level analyzer being supplied to said judging unit.

27. The signal demodulator as set forth in claim 26, further comprising a signal separator for separating said information carrying signal into a first-channel signal and a second-channel signal, and said level analyzer and said wave discriminator are duplicated so that said first-channel signal and said second channel signal are supplied separately to said level analyzers and said wave discriminators and selectively to said plural modulation discriminators.

28. A method for reproducing an original signal from an information carrying signal, comprising the steps of:

- a) receiving said information carrying signal;
- b) analyzing said information carrying signal so as to evaluate at least one feature of a waveform of said information carrying signal;
- c) investigating the evaluation to see what sort of modulation technique is to exhibit said at least one feature so as to determine the sort of modulation technique employed in said information carrying signal;
- d) selecting a demodulation technique corresponding to said sort of modulation technique from plural candidates; and
- e) reproducing said original signal from said information carrying signal through said demodulation technique.

29. The method as set forth in claim 28, in which said at least one feature is a similarity of said waveform to reference waveforms.

30. The method as set forth in claim 28, in which another feature of said waveform is further evaluated in said step b), and said sort of modulation technique is determined on the basis of both of said at least one feature and said another feature.

31. The method as set forth in claim 30, in which said at least one feature and said another feature are a similarity of said waveform to reference waveforms and peak-to-peak intervals found in said waveform.

32. The method as set forth in claim 31, in which said information carrying signal is decided to be directly produced from an analog signal when said peak-to-peak intervals are not unique to plural sorts of modulation techniques.

33. A sound reproducing apparatus for reproducing an original signal carrying pieces of music data information from an information carrying signal, comprising:

a detector supplied with said information carrying signal, and including an analyzer supplied with said information carrying signal and evaluating at least one feature of said information carrying signal found in a waveform of said information carrying signal and a judging unit connected to said analyzer and investigating the evaluation supplied from said analyzer to see what sort of modulation technique is to exhibit said at least one feature so as to produce a control data signal representative of the sort of modulation technique employed in said information carrying signal;

a demodulator connected to said detector, responsive to said control data signal so as to select one of plural function planes respectively assigned to plural sorts of demodulation techniques, and reproducing a continuous signal containing a first sub-signal representative of said pieces of music data information and a second sub-signal supplemented in the absence of said first sub-signal from said information carrying signal through the demodulation technique on said one of said plural function planes;

a data converter connected to said demodulator, and eliminating said second sub-signal from said continuous signal so as to reproduce said original signal from said continuous signal; and

a signal converter connected to said data converter, and producing an analog audio signal carrying said pieces of music data information from said original signal.

34. The sound reproducing apparatus as set forth in claim 33, in which said analyzer further evaluates another feature of said information carrying signal found in said waveform of said information carrying signal, and said judging unit determines said sort of modulation technique on the basis of the evaluation to said at least one feature and said another feature.

35. The sound reproducing apparatus as set forth in claim 33, in which said at least one feature is a similarity of said waveform to plural reference waveforms.

36. The sound reproducing apparatus as set forth in claim 34, in which said at least one feature and said another feature are a similarity of waveform to plural reference waveforms and peak-to-peak intervals found in said waveform.

37. The sound reproducing apparatus as set forth in claim 35, in which said analyzer includes

a wave discriminator comparing said waveform with a predetermined amplitude range to see whether or not said information carrying signal is fallen within said predetermined amplitude range so as to determine a first time period in which said information carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said simi-

larity on the basis of a ratio between said first time period and said second time period.

38. The sound reproducing apparatus as set forth in claim 37, in which said wave discriminator includes

a rectifier supplied with said information carrying signal and making said information carrying signal vary the amplitude in one of the positive and negative ranges,

an averaging circuit connected to said rectifier for determining an average value of said amplitude,

a comparator having two thresholds defining said predetermined amplitude range and comparing said information carrying signal with said two thresholds to produce an output signal representative of said first time period and said second time period, and

a signal generator connected to said comparator and producing an output signal representative of said similarity.

39. The sound reproducing apparatus as set forth in claim 38, in which one of said two thresholds is 80 percent of said average value, and the other of said two thresholds is 120 percent of said average value.

40. The sound reproducing apparatus as set forth in claim 36, in which said analyzer includes

a wave discriminator supplied with said information carrying signal, comparing said waveform with a predetermined amplitude range to see whether or not said information carrying signal is fallen within said predetermined am-

plitude range so as to determine a first time period in which said information carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said similarity on the basis of a ratio between said first time period and said second time period; and

plural modulation discriminators supplied with said information carrying signal, determining said peak-to-peak intervals of said information carrying signal, and producing output signals each representative of either consistency or inconsistency with one of plural sorts of modulation techniques,

said output signal of said wave discriminator and said output signals of said plural modulation discriminators being supplied to said judging unit.

41. The sound reproducing apparatus as set forth in claim 33, in which said information carrying signal is produced from an analog signal representative of sound or a data stream containing music data codes and meaningless codes, and said judging unit further determines that said information carrying signal was produced from said analog signal in the absence of the features unique to plural sorts of modulation techniques.

42. The sound reproducing apparatus as set forth in claim 41, in which said analyzer includes

a wave discriminator supplied with said information carrying signal, comparing said waveform with a predetermined amplitude range to see whether or not said information carrying signal is fallen within said predetermined amplitude range so as to determine a first time period in which said information

carrying signal is within said predetermined amplitude range and a second time period in which said information carrying signal is out of said predetermined amplitude range, and determine said similarity on the basis of a ratio between said first time period and said second time period;

plural modulation discriminators supplied with said information carrying signal, determining said peak-to-peak intervals of said information carrying signal, and producing output signals each representative of either consistency or inconsistency with one of plural sorts of modulation techniques;

an analog signal discriminator supplied with said output signals of said plural modulation discriminators, and producing an output signal representative of said analog signal when said plural modulation discriminators determine that said plural sorts of modulation techniques are not found in said information carrying signal; and

a level analyzer supplied with said information carrying signal, and checking said information carrying signal to see whether or not the amplitude is wider than a predetermined range so as to produce an output signal representative of silence or sound,

said output signal of said wave discriminator, said output signals of said plural modulation discriminators, said output signal of said analog signal discriminator and said output signal of said level analyzer being supplied to said judging unit.

43. The sound reproducing apparatus as set forth in claim 42, further comprising a signal separator for separating said information carrying signal into

a first-channel signal and a second-channel signal, and said level analyzer and said wave discriminator are duplicated so that said first-channel signal and said second channel signal are supplied separately to said level analyzers and said wave discriminators and selectively to said plural modulation discriminators.

44. A method for reproducing an original signal representative of pieces of music data information from an information carrying signal, comprising the steps of:

- a) receiving said information carrying signal;
- b) analyzing said information carrying signal so as to evaluate at least one feature of a waveform of said information carrying signal;
- c) investigating the evaluation to see what sort of modulation technique is to exhibit said at least one feature so as to determine the sort of modulation technique employed in said information carrying signal;
- d) selecting a demodulation technique corresponding to said sort of modulation technique from plural candidates;
- e) reproducing a continuous signal containing a first sub-signal representative of said pieces of music data information and a second sub-signal supplemented in the absence of said first sub-signal from said information carrying signal through said demodulation technique;
- f) eliminating said second sub-signal from said continuous signal for reproducing said original signal; and

g) producing an analog audio signal carrying said pieces of music data information from said continuous signal.

45. The method as set forth in claim 44, in which said at least one feature is a similarity of said waveform to reference waveforms.

46. The method as set forth in claim 44, in which another feature of said waveform is further evaluated in said step b), and said sort of modulation technique is determined on the basis of both of said at least one feature and said another feature.

47. The method as set forth in claim 46, in which said at least one feature and said another feature are a similarity of said waveform to reference waveforms and peak-to-peak intervals found in said waveform.

48. The method as set forth in claim 47, in which said information carrying signal is decided to be directly produced from an analog signal when said peak-to-peak intervals are not unique to plural sorts of modulation techniques.